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ABSTRACT

Seventeen years ago a group of researchers at the University of Michigan became interested in the possibility that occupational health may be determined by psychological as well as physical hazards in the work environment. This symposium reports on current work in testing a unified theory of the effects of psychosocial stresses on mental and physical health. This document is divided into four sections: (1) Job Demands and Worker Health; Introduction; (2) Occupational Differences in Job Demands and Strain; (3) Job Stress as Person-Environment Misfit; and (4) Effects of Social Support on Occupational Stresses and Strains. (JLL)

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Job Demands and Worker Health: Introduction

John R. P. French, Jr.

Occupational Differences in Job Demands and Strain

Robert D. Caplan

Job Stress as Person-Environment Misfit

R. Van Harrison

Effects of Social Support on Occupational
Stresses and Strains

S. R. Pinneau, Jr.

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JOB DEMANDS AND WORKER HEALTH: INTRODUCTION

John R. P. French, Jr.

Most of us have grown accustomed to reading on packages of cigarettes, "Warning: The Surgeon General has determined that cigarette smoking is dangerous to your health." On the other hand, it would probably be somewhat of a surprise if one of us applied for a job and saw the following statement on the top of the application blank, "Warning: The role demands in this occupation may be dangerous to your health."

Seventeen years ago a group of us at The University of Michigan became interested in the possibility that occupational health may be determined by psychological as well as physical hazards in the work environment. Accordingly, we set up a research group at the Institute for Social Research now known as the Social Environment and Mental Health Program. Throughout these seventeen years we have attempted to develop a systematic unified theory of the effects of psychosocial stresses on mental and physical health. Our symposium today reports on our current work in testing this theory. This research was funded by the National Institute for Occupational Safety and Health. The major contributors to this particular project included Sidney Cobb, M.D., the co-principal investigator, and the four members of this symposium.

The general theoretical model which has guided several of the research projects in our program and which unites the three papers in this symposium is presented in Figure 1. The arrows represent hypothesized causal relations, running from cause to effect; an arrow terminating on a second arrow represents a conditioning effect which modifies the causal relationship denoted by the second arrow. Each box in Figure 1 represents a whole panel of variables but only the more general types of the variables are illustrated here. Later figures will present more specific variables.

This study was supported by Contract SHM-99-72-61 and Grant 1 R01 OH 00563-01, National Institute for Occupational Safety and Health, U.S. Department of Health, Education, and Welfare. John R. P. French, Jr., Sidney Cobb, Robert D. Caplan, and S. Richard Pinneau were major contributors to this study and Melinda Wagner served as research assistant. William Kroes and Bruce Margolis of NIOSH are thanked for their advice throughout the "Job Demands and Worker Health" project.

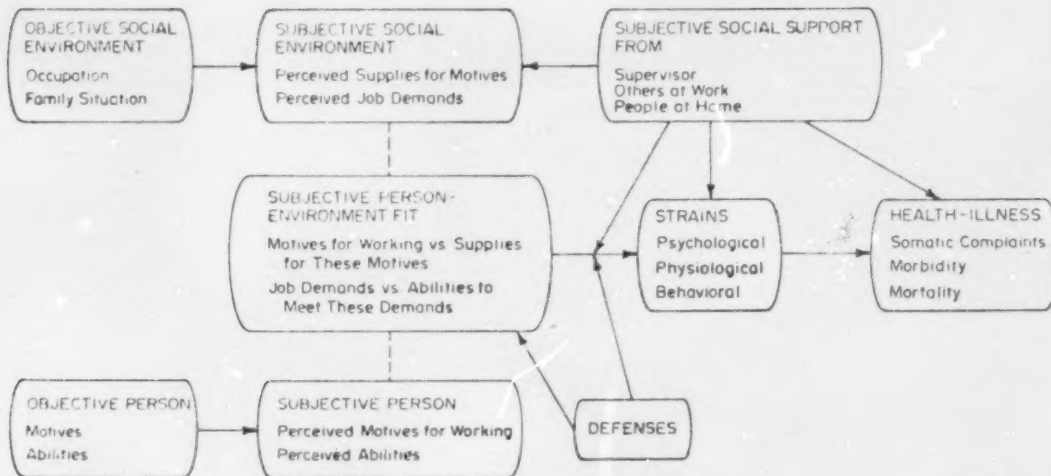


Figure 1. A General Model of the Effects of the Social Environment on Psychological Strain and Health.

The top three panels of variables refer to the environment, while the bottom three refer to more or less enduring characteristics of the person.

The first two boxes in the top row make the distinction between the objective environment and the subjective environment. The subjective environment is defined as a person's perception of his objective situation; it is equivalent to what Kurt Lewin called the "psychological environment." The third panel in the top row, social support from others, is really a part of the subjective social environment, but it is shown separately both for emphasis and because it affects other aspects of the social environment such as perceived job demands. Moving now to the bottom row, we draw a parallel distinction between the objective and the subjective person. The latter refers to what is often called the self concept. For our purposes the most important parts of the subjective person are the person's perceived motivation and perceived abilities.

The perceived motives for working are related to the perceived supplies for these motives. The broken line linking the person and his environment represents the goodness of the fit between the person and his environment. If the motives in the person and the corresponding supplies for these motives in his environment can be measured on commensurate dimensions, then we can calculate a discrepancy score which yields a quantitative measure of adjustment conceived as the goodness of fit between the person and his environment. For example, the fit with respect

to the motivation to work overtime can be measured on a scale of hours of over-time; we can subtract the actual hours of overtime from the desired hours of overtime to derive a score representing deprivation of the motivation to work overtime. Similarly, one could measure the goodness of fit for a person in a secretarial job as the discrepancy between the number of words per minute of typing which are demanded by the job and the number of words per minute which the person can type.

Our central hypothesis states that job stress, particularly subjective person-environment fit, is a major cause of psychological, physiological, and behavioral strains. These strains, such as anxiety, or increased blood pressure, or excessive smoking, in turn are hypothesized to affect various measures of health and illness.

Finally, we note that psychological defenses will influence both the goodness of fit and also the effect of this fit on various strains. No data on defenses will be presented today.

Now we can define the words "stress" and "strain" in terms of the more basic concepts I have just described. In this symposium "stress" refers to any characteristics of the job environment which pose a threat to the individual--either excessive demands or insufficient supplies to meet his needs. "Stress" also refers to a misfit between the person and his environment. On the other hand, "strain" refers to any deviation from normal responses in a person. These include psychological strains such as job dissatisfaction and anxiety, physiological strains such as high blood pressure, and behavioral symptoms of strain, such as smoking and dispensary visits. Now let us turn to the study itself.

In order to test this theoretical model we designed a study which was based on the known fact that there are very large occupational differences in strain, morbidity, and mortality. It was hoped that this model might help to explain these differences. Accordingly, we selected a sample of 23 occupations chosen to represent a wide array of job demands and a good range of occupational differences in strain and in health. For example, air traffic controllers were chosen for study because of their high rates of peptic ulcer and hypertension, while college professors and scientists were included with the expectation that they would generally experience a low incidence of these disorders. Because the study focuses on social and psychological hazards of work, we attempted to eliminate occupations which are high in physical hazards, such as toxic chemicals. In order to avoid confounding occupational differences with organizational differ-

ences, we selected our samples from 67 different sites, so that each occupation was drawn from 2 or more different organizations. As shown in Table 1 of the handout, a total of 2,010 male volunteers were included in the sample. Some of the analyses to be reported today used this total sample.

However, the number of men varied greatly from one occupation to another. So, in order to avoid over-representing some occupations and under-representing others, many of our analyses were performed on a random stratified subsample consisting of 318 men with equal numbers from each of the 23 occupations.

A third subsample consisted of 390 men on whom we were able to obtain physiological data. These men were drawn from machine-paced assembly line workers, electronic technicians, supervisors, air traffic controllers, scientists, and administrators.

The design of the study was cross-sectional, that is, each individual was measured at only one point in time. The questionnaire measuring 20 dimensions of job stress, 17 dimensions of strain within the person, and a variety of demographic and personality variables, was administered to all 2,010 men. At the same time, blood pressures and blood samples were secured from the 390 men in the physiological subsample.

The psychological measures used in the study were derived from questionnaire items which required ratings on a 5-point scale. Typically the scales ranged from 1 = "very little", to 5 = "a great deal". For each of our major variables, multi-item indices were constructed, with most indices containing from 3 to 7 items. Table 2 of the handout presents the reliability coefficients and the number of items in each of our more important measures. These reliabilities ranged from .71 to .92.

The measures of stresses in the subjective environment included quantitative work load, role ambiguity, job complexity, responsibility for people, participation, and underutilization of abilities. The four-item measure of role ambiguity, for example, included items such as, "How much of the time are your work objectives well defined?" and, "How often can you predict what others will expect of you on the job?". Underutilization of abilities was measured by items such as "How often are you given a chance to do the things you do best?". Quantitative workload was measured by seven items such as "How much slowdown in the workload do you experience?" and "How much time do you have to do all your work?".

The goodness of fit between the person and his work environment was measured with respect to four dimensions: role ambiguity, responsibility for people, com-

TABLE 1
Occupational Groups and Their Sample Sizes

Occupational Groups ¹	N
Forklift driver	46
Assembler, machine paced	79
Assembler, machine paced relief	27
Assembler, nonmachine paced	69
Machine tender	34
Continuous flow monitor	101
Delivery service courier	20
Tool and die maker	77
Electronic technician	93
Policeman	111
Train dispatcher	86
Blue collar supervisor	178
White collar supervisor	42
Air traffic controller, large airports	82
Air traffic controller, small airports	43
Programmer	90
Accountant	92
Engineer	110
Scientist	117
Professor	74
Administrative professor	25
Administrator	253
Family physician	104
Miscellaneous, gathered incidentally	57
<u>Total</u>	2010

¹This ordering of occupational groups reflects--with some minor changes--an arrangement from lowest to highest Duncan SES score and therefore from lowest to highest socioeconomic status.

TABLE 2
Reliabilities of Selected¹ Measures of Subjective Environmental Stress and Strain

Measures:	Cross-sectional Estimate ²	Number of Items
Subjective Environmental Stress:		
Quantitative Work Load	.71	7
Role Ambiguity	.84	4
Job Complexity	.72	6
Responsibility for People	.89	4
Participation	.80	3
Underutilization of Abilities	.85	3
Social Support:		
Social Support from Supervisor	.83	4
Social Support from Others at Work	.73	4
Social Support from Wife, Friends, Relatives	.81	4
Person-Environment Fit:		
Role Ambiguity	.74	4
Responsibility for People	.74	4
Work Load	.71	7
Complexity	.72	6
Strain:		
Depression	.83	6
Anxiety	.75	4
Irritation	.80	3
Somatic Complaints	.76	10
General Job Satisfaction	.85	4
Work Load Satisfaction	.82	3
Boredom	.86	3
Total Satisfaction	.92	10

¹Data on the full set of 58 measures from the questionnaire are presented in Caplan et al., Job demands and worker health: Main effects and occupational differences. (USGPO Catalog No. HE 20. 7111:J57. USGPO Stock No. 1733-00083.) Washington, D.C.: U. S. Government Printing Office, 1975.

²The estimate of reliability for all measures is computed using the following formula (cited in Nunnally, 1967):

$$r_{kk} = \frac{k\bar{r}_{1j}}{1+(k-1)\bar{r}_{1j}}$$

where k is the number of items in the test and $\bar{r}_{1j}$ is the average intercorrelation between items in the test.

plexity, and work load. As will be described later, these measures were derived by asking the man questions about his actual working environment and his desired work environment. For example, we asked, "How much time do you have to do all your work?" and "How much time would you like to have to do all your work?".

The measures of psychological strain were based on previous research on job satisfaction, depression, anxiety, somatic complaints, etc. For example, the measure of somatic complaints included ten items reporting a variety of symptoms such as sweating palms, upset stomach, loss of appetite, trouble sleeping, etc.

The physiological measures included standard measures of blood pressure, heart rate, serum cholesterol, thyroid hormones, serum uric acid, and serum cortisol.

Let us turn now to the results of this study. First, Dr. Caplan's paper presents occupational differences in stresses, strains, and measures of health. His multivariate analyses examine sequences of intervening variables between occupation on the one hand and health outcomes on the other. Next, Dr. Harrison examines the goodness of fit between the man and his work environment and its consequences for well being and health. Finally, Dr. Pinneau reports on the role of social support in affecting job stress and strain within the person.

OCCUPATIONAL DIFFERENCES IN JOB DEMANDS AND STRAIN

Robert D. Caplan

This afternoon I want to raise and attempt to answer several questions about the relationships between stress and strain. These questions center on the main effects of job demands on worker health. They can be stated as follows:

- (1) What are the major occupational differences in job demands or stress?
- (2) What are the major occupational differences in psychological and physiological strain?
- (3) Are the stresses and strains which differ across the occupations related? If so, in what ways?
- (4) How well do our measures of job demands explain the occupational differences in strain? As a corollary, does occupation as a demographic variable add anything to our knowledge of the likely causes of strain beyond what we learn from the measures of job demands in this study?
- (5) Finally, what are the implications of these findings for improving the well-being of people who work?

Results

Occupational Differences

Table 1 presents a summary of occupational differences in strain. For the purposes of simplifying the presentation, the 23 occupations have been collapsed into four groups. The unskilled blue collar jobs include assembly line workers, relief workers on the lines, fork lift drivers, and machine tenders. The skilled blue collar workers are represented by tool and die makers. The white collar non-professionals include police, electronic technicians, foremen and supervisors, air traffic controllers, and train dispatchers as well as others. Finally the professionals include scientists, physicians, professors, administrative professors, administrators, accountants, and engineers.

As can be seen from Table 1, blue collar workers were high on job dissatisfaction and white collar workers were low. This measure of dissatisfaction asked people if they would take the same job over again, recommend it to a friend, and take the job if they did not have to work for a living.

Unskilled blue collar workers, compared to the other groups, had very high scores on Boredom, on Depression, and on Somatic Complaints. Among these unskilled blue collar workers, workers on machine-paced assembly lines had very

Table 1
Summary of Occupational Differences in Strain

STRAIN	BLUE COLLAR		WHITE COLLAR	
	UNSKILLED	SKILLED	NONPROFESSIONAL	PROFESSIONAL
JOB DISSATISFACTION	+	+	-	-
BOREDOM	++	0	-	-
ANXIETY	0	0	0	0
DEPRESSION	+	0	0	0
SOMATIC COMPLAINTS	++	0	0	0

Note: Each + or - represents one-third of a S.D. deviation from the mean of the stratified random sample, 0 = near the mean.

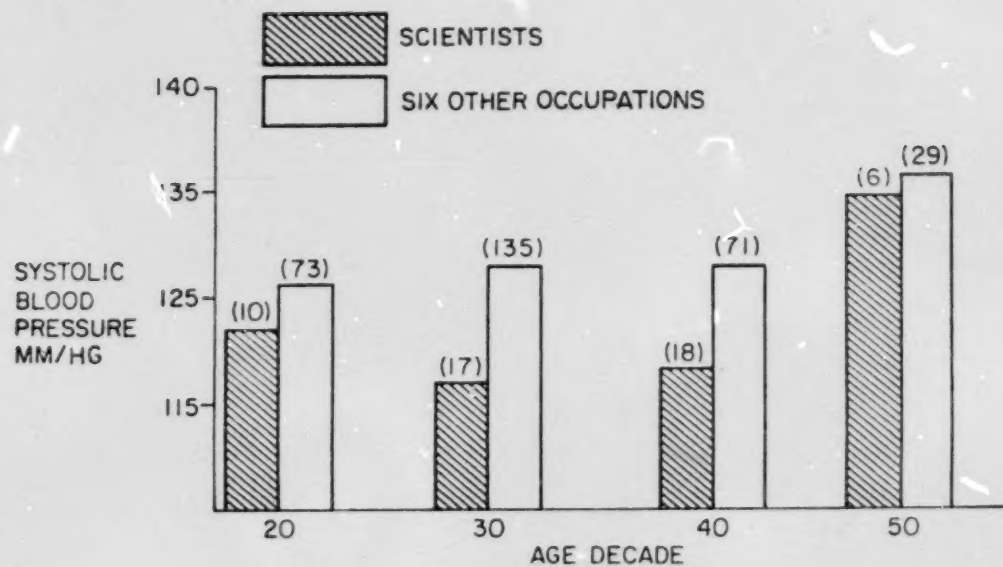


Figure 1. Occupational Differences in Systolic Blood Pressure
 $F_{(6,352)} = 3.78, p < .002$ Across Occupations

high levels of strain. White collar employees had particularly low scores on Boredom. Boredom was assessed by a set of items asking about whether or not the work was interesting. Depression was based on a scale derived from several psychiatric studies and research by Cobb (1970) on men losing their job. The measure of somatic complaints included complaints such as difficulty sleeping, sweaty palms, upset stomach, feeling one's heart beating hard, having spells of dizziness, and so forth. There were no occupational differences in levels of anxiety.

For the subsample for which we have physiological data, we found that the scientists, compared to all six other occupational groups, had the lowest level of systolic blood pressure. This was the case even when the data were stratified by age groups. This finding is presented in Figure 1. There was a similar but nonsignificant trend for diastolic blood pressure. These findings parallel those found at NASA where scientists, compared with administrators and engineers, had the lowest levels of blood pressure and of stress (Caplan, 1971). There were no occupational differences in cholesterol, uric acid, heart rate, or other physiological variables.

As part of the study we asked people the reasons for their last visit to a physician for other than a routine check-up. These data produced the following results. An analysis by occupation showed that cardiovascular disease (χ^2 (d.f. = 22) = 36.53, $p = .03$) and respiratory diseases such as colds (χ^2 (d.f. = 22) = 54.77, $p < .001$) differed significantly in their reported frequencies across the occupations. Professors had the lowest rates for both of these diseases. We were unable to draw further conclusions about occupational differences because the sample sizes were too small for this purpose.

Were the high strain occupations also high in stress? Table 2 summarizes occupational differences in levels of job stress. The unskilled blue collar workers stand out. They had the greatest underutilization of their skills and abilities and the poorest person-environment fit between the amount of complexity and responsibility found on the job and the amount that they wanted. They also had very high levels of ambiguity about the future security of their jobs and the future value of their job skills. Furthermore, they reported low participation and low social support from others on the job. In particular, workers on machine-paced assembly lines reported high levels of job stress.

By contrast, the tool and die makers and the professionals reported little underutilization. The professionals reported better than average fit between

the amounts of complexity and responsibility for persons on the job and the amount they wanted. Nonprofessional white collar workers fell at about the mean on all the stresses in Table 2.

Table 2
Summary of Occupational Differences in Stress

STRESS	<u>BLUE COLLAR</u>		<u>WHITE COLLAR</u>	
	UNSKILLED	SKILLED	NONPROFESSIONAL	PROFESSIONAL
UNDERUTILIZATION	++	-	0	--
POOR FIT:				
COMPLEXITY	++	0	0	--
RESPONSIBILITY	+	+	0	-
FUTURE AMBIGUITY	++	+	0	0
LOW PARTICIPATION	+	0	0	0
LOW SOCIAL SUPPORT	+	0	0	0

Note: Each + or - represents one-third of a S.D. deviation from the mean of the stratified random sample. 0=near the mean.

These findings suggest that stress and strain are related because the blue collar unskilled workers had both high levels of strain and high levels of job stress whereas stress and strain tended to be low for white collar professionals. To see whether or not these stresses and strains were in fact associated, correlational types of analyses were performed within the occupationally stratified, random subsample.

Relationships between Stress and Strain

Figure 2 provides a road map that will be followed in presenting the remaining findings. In the box on the far left we have occupation. Each occupation is composed of a different set of job stresses or demands. The solid arrows denote that these stresses are hypothesized to lead to job-related affects including dissatisfaction with the work and boredom. These affective states, in turn, are anxiety, and somatic complaints. The broken lines represent theoretically derived relationships expected if the causal relationships depicted by the solid arrows hold true. Accordingly, the relationship of job stress to the general affects

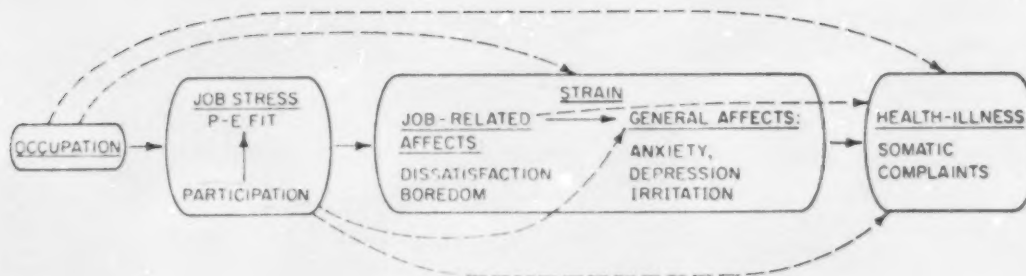


Figure 2. A General Model of the Relationships Between Occupation, Job Stress, Strain, and Health Illness. Dotted arrows represent relationships theoretically derivable if the causal arrows hold true.

should operate via the job-related affects. The relationship between occupation and the affects should operate via intervening job demands or stresses.

To test these hypotheses, we first described the relationship between stress and strain through correlational analyses. Partial correlation was used to examine the extent to which the variance in the theoretically derived relationships could be explained by partialling out variance in the dependent variables which was due to intervening variables. Multiple regression was used to determine the total amount of variance explained by all hypothesized predictors of each variable in the model. With few exceptions only predictors with correlation coefficients $\geq .30$ were considered so that we would be describing relationships with at least 9% explained variance.

The first of the findings is summarized in Figure 3. Three variables predicted to dissatisfactions with the amount of work load the person had. These variables were the amount of unwanted overtime, the amount of work load the person reported relative to the amount of work load the person wanted on the job, and poor fit with regard to the complexity of the job. Poor fit on complexity meant either having a job which was more complex or less complex than the person wanted. Together these three variables accounted for 38% of the variance in work load dissatisfaction.

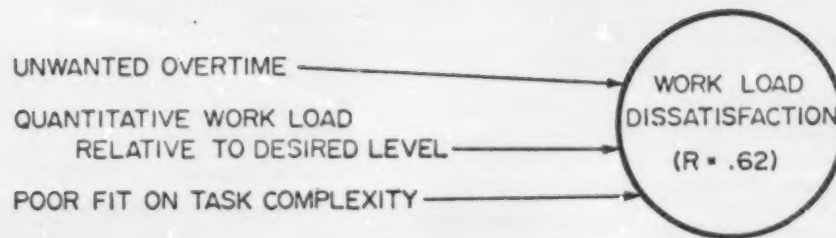


Figure 3. Predictors of Work Load Dissatisfaction

Figure 4 summarizes the predictors of Boredom. Boredom was related to having too much or too little task complexity, to having too much or too little responsibility for persons, to being underutilized, to experiencing ambiguity about the security of one's job and the future value of one's skills, and to experiencing low participation. These predictors all correlated with boredom between .32 and .51 ($R = .64$, $p < .001$).

It is unlikely that low participation, in and of itself, produced boredom. It is more likely that low participation prevented people from getting (a) the most self-utilization out of their jobs and (b) the best person-environment fit on job complexity and responsibility for others. The data support this reasoning. First high participation was found to be related to high levels of utilization and person-environment fit (the correlation coefficients ranged from .31 to .39). Second, when we partialled out the effects of utilization and of person-environment fit on complexity and responsibility, the relationship between participation and boredom completely disappeared ($r = -.03$). Consequently the process of participation may prevent boredom by allowing people to develop better utilization of their abilities and better fit with the job.

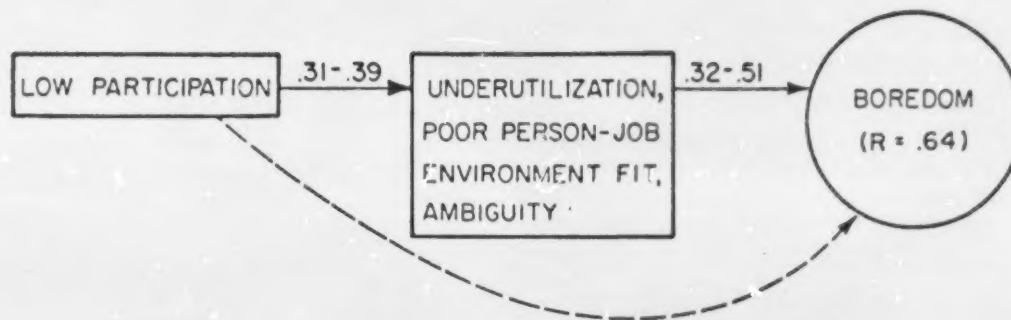


Figure 4. Predictors of Boredom

When we examined a third job-related affect, general dissatisfaction with the job, its predictors turned out to be almost identical to those which predicted to boredom and dissatisfaction with work load. Thirty-five percent of the variance ($R = .59$) in general job dissatisfaction was accounted for by its predictors. Boredom was one of the major components of general job dissatisfaction, the two correlating .63.

Now let us turn to the main predictors of the more general states of strain. These relationships are summarized in Figure 5. Role Conflict and Work Load Dissatisfaction were both positively correlated with Irritation. Together Irritation's two predictors accounted for 16% of its variance.

The next strain considered was Anxiety. Work Load Dissatisfaction and Overall Job Dissatisfaction accounted for 11% of the variance in Anxiety.

There were several predictors of Depression. Low social support from one's supervisor and others at work as well as all three measures of job-related affect were positively correlated with Depression. The measure of Social Support asked whether or not people at work were willing to listen to the employee, take what the employee said as important, and would go out of their way to help the employee. Together, Depression's five predictors accounted for 24% of its variance.

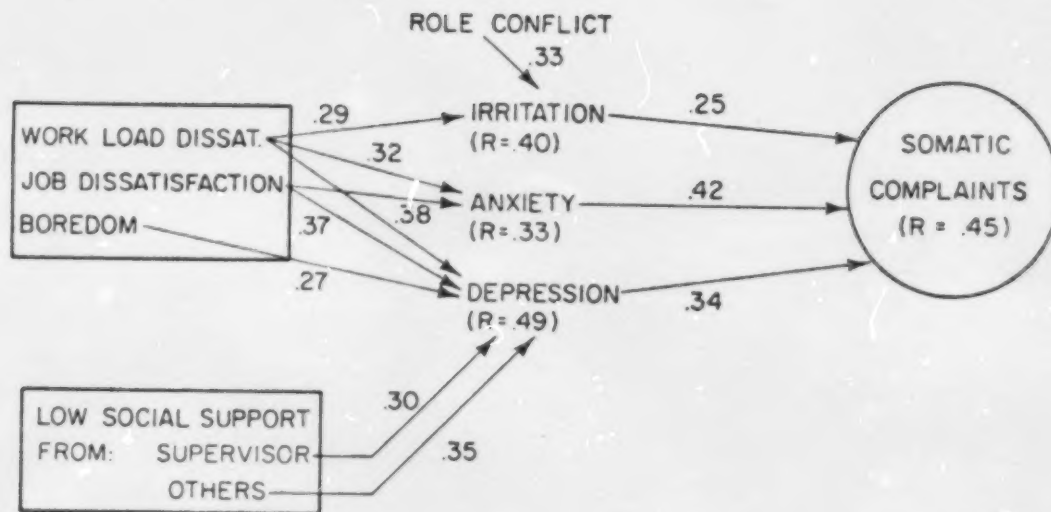


Figure 5. Predictors of Irritation, Anxiety, Depression, and Somatic Complaints

Irritation, Anxiety, and Depression, rather than the job-related affects, were the strongest predictors of Somatic Complaints. Together Irritation, Anxiety, and Depression accounted for 20% of the variance in Somatic Complaints.

Confirming much of the hypotheses in Figure 2, these data suggest that job stress may determine general emotional states such as depression by determining job-related affects. Two findings support this hypothesis. First, although there were relationships between job stress and Anxiety, Depression, Irritation, and Somatic Complaints in our data, these relationships were all weaker than those between job stress and job-related affects. Second, although these weak relationships when combined accounted for 11% to 20% of the variance in the general strains, one half or more of that variance was removed when we partialled out the intervening effects of job-related affects. Furthermore, all of the effects of job-related affects on Somatic Complaints (4% of the variance) were statistically accounted for when the intervening set of affects--Anxiety, Irritation, and Depression--were partialled out. Vickers¹, in an independent

¹Personal communication, December, 1975, Navy Personnel Research and Development Center, San Diego, California.

study of white collar employees at NASA, has similarly found that job demands appear to lead to job-related affects which in turn influence general affective states.

Occupation: a needed descriptor?

Now let us consider whether occupation, an independent variable, explains any additional variance in our measures of strain and health once we have considered all our measures of job demands and person-environment fit. We think this is a useful test of the theory. The analysis should demonstrate the usefulness of studying the underlying characteristics of occupations, that is their role demands and their employees motivations, as the best way of understanding the determinants of employee health. And the analysis should suggest that merely examining occupational differences in strain is not particularly helpful in designing a program of preventive occupational health.

The procedures used for the analysis were as follows. First, in addition to occupational title, only the indices of job demands, personality, and person-environment fit which were major correlates of psychological strain and somatic complaints were considered as predictors of strain. These variables were used as predictors if they correlated .30 or greater with the measures of strain and health being studied. Most of these predictors had main effects which I have described already. One interaction effect of work load fit and complexity fit was also used as a predictor.

All of these significant predictors were entered into multiple regression analyses to determine the percentage of variance they accounted for in each strain. The identical set of predictors was used for every strain examined, a procedure recommended by Nunnally (1967, p. 163) to avoid biasing upwards the obtained percent of variance in the multiple-regression analysis.

As the next step, we statistically removed the variance in each strain due to the set of predictors. Then the remaining variance in each strain was analyzed by multiple regression using occupational title as a categorical, dummy predictor. Details of dummy variable analysis have been described by Cohen (1968).

Table 3 summarizes the results of these analyses. The data are presented as R^2 or the percentage of variance accounted for by the predictors. R^2 adjusted for degrees of freedom was virtually the same as R^2 in these analyses because of the large sample size.

Table 3
Summary of the Contributions of Occupation, Stress
and Personality to Variance in Strain: R²

STRAIN	A. OCCUPATION ¹	B. UNDERLYING PREDICTORS ²	C. OCCUPATION CONTROLLING FOR B	D. 1-C/A
JOB RELATED AFFECTS Eg. JOB DISSATISFACTION, BOREDOM	.08-.29	.38-.44	.03-.07	.62-.76
GENERAL AFFECTS Eg. ANXIETY, IRRITATION	.03-.05	.15-.23	.03-.04	.00-.25
SOMATIC COMPLAINTS	.07	.12	.03	.57

Note: N ≈ 1926. All R² values p < .001.

¹ Represented by 22 dummy variable predictors.

² Number of predictors = 23.

The left column in Table 3 lists the strains whose variance we are trying to explain. Column A describes the main effects of occupation. Occupation accounted for 8 to 29% of the variance in job-related affects, only 3 to 5% of the variance in the general affects, and 7% of the variance in Somatic Complaints.

Column B presents the main effects of the predictors underlying occupation. They accounted for 38 to 44% of the variance in the job-related affects, 15 to 23% of the variance in the general affects, and 12% of the variance in Somatic Complaints. Occupation and its underlying measures as predictors both did better in accounting for variance in the job-related affects than in the general affects and somatic complaints. A comparison of occupation with its underlying predictors, however, showed that the underlying predictors accounted for more variance in strain without exception.

Column C shows what happened to the predictive power of occupation as a variable when variance in the strains due to the underlying measures was removed by partialling techniques. Occupation's predictive power dropped markedly. Instead of explaining 8 to 29% of the variance in the job-related affects, it explained only 3 to 7%. The drop in predictive power was not as marked for the general affects although it was for Somatic Complaints.

Column D presents another way of summarizing these results. Here we ask what percentage of the variance in strain initially due to occupation was accounted for by occupation's underlying variables. Sixty-two to 76% of the vari-

ance initially due to occupation in the job-related affects was explained by our underlying measures. Zero to 25% of the variance in the general affects due to occupation was explained by our underlying measures. The zero percent represents the case of anxiety where all of its variance due to occupation was unique and not explained by underlying measures. Finally, 57% of the variance in somatic complaints initially accounted for by occupation was explained by our underlying measures.

The analysis which I have just described is really a conservative test of the assertion that occupation is a surrogate for underlying measures of person, environment, and person-environment fit. It is conservative because we did not attempt to exhaustively measure all relevant descriptors of the job environment and the employee. So we have probably underestimated the amount of variance in the strains due to job demands and employee characteristics.

Nevertheless, the results are remarkably similar to those obtained in a recent random sample study of the work force of the United States by Quinn and his colleagues (Barnow, Mangione, & Quinn, 1973). In that study 28% of the variance in job satisfaction was accounted for by measures of the quality of employment--measures that were conceptually similar to our own. Quinn reported that occupation explained only an additional one percent of variance in job-related strain. Similarly, race, age, sex, and educational level explained only an additional one percent of the variance in job satisfaction.

Discussion

Cause and Effect in this Cross-Sectional Survey

Our findings have been interpreted as if they represented cause and effect. In essence, plausible hypotheses about the direction of causation have been inferred from the data because there are no adequate techniques for dealing with causal models in cross-sectional sets of data (indeed, even in longitudinal studies it is often difficult to untangle competing causal hypotheses). Nevertheless, many experiments (e.g., Coch & French, 1948; Morse & Reimer, 1956; Campbell, 1973) support our inferences.

These experiments notwithstanding, our survey design has still made it difficult to tell whether or not the associations between job stress and worker health are really a coincidence of occupational differences in general life styles. These life styles may vary by occupation and may have effects on health which are independent of the job stresses of the employees.

For example, were the high levels of depression and somatic complaints among unskilled blue collar workers really due to the job or were they due to the general nonwork life style of these employees? Similarly, was the relatively good health of professionals really due to their ability to afford better health care, more nutritious meals, and a more satisfying pattern of life?

In reply to these questions, we are inclined to believe that part of the occupational differences in stress and strain is due to factors on the job for two reasons. First, additional analyses indicate that these relationships are largely replicated within occupations where people have roughly the same nonwork environments. As one example, I shall shortly describe two groups of unskilled blue collar workers who appear to be from the same nonwork environment. These two groups had different levels of job stress which appeared to partly account for their different levels of strain.

A second reason for why the occupational differences in strain appear due to job factors deals with the pattern of relationships we have found between job demands and strain. The relationships between perceived conditions of work environments and general psychological states such as depression were largely accounted for by job-related affects. It is unlikely that nonwork stresses would have affected job-related affects, and we have some data to support this assertion. Low social support from the supervisor and from others at work jointly accounted for 16% of the variance in general job dissatisfaction (r 's = .34 and .35, respectively). By contrast, low social support from wife and friends and relatives only accounted for 2% of the variance in job dissatisfaction.

Designing Programs to Improve Employee Well-being

Our findings suggest several considerations in designing programs to improve the quality of work. First, the findings suggest that there is little to be gained by continuing to study occupational distributions of strain when one's aim is to improve employee health. Even if you discover an association, occupational categories and other demographic characteristics are not very open to change. Underlying characteristics of the job and job fit on dimensions such as complexity, work load, or responsibility are much more open to change, so they deserve more attention as causes of ill health.

Second, one has to remember that findings about the distribution of strain across occupations may not apply at other points in time or in other organizational environments. It is far wiser to concentrate on more generalizable and inherently less transient relationships between basic characteristics of work,

workers, and strain. One should not be side-tracked by occupational categories which, at best, are often subject to arbitrary definitions.

Third, the results suggest that the practitioner who wishes to be selective in measuring strains would do best to concentrate on measures of job-related affects. The job-related affects appear more likely than the general affects to show variance as the result of programs which modify job stress.

Fourth, the analyses suggest that our self-report measures of job and employee characteristics are worth considering by practitioners who wish to modify the objective job environment along these dimensions. These measures accounted for substantial amounts of variance in the job-related affects. The measures should provide some useful indications of the extent to which employees subjectively perceive that the quality of their work environments is indeed being changed.

Having argued that we may have produced some useful paper and pencil measures for assessing programs for preventing or reducing psychological strain and somatic complaints in employees, let us examine a case where these measures detect clear differences between two very similar occupations, one of which experienced some marked innovations in job design.

The Case of Machine vs. Self-paced Assembly Lines

As you will recall, workers on machine-paced assembly lines had the most strain and very high levels of job stress. Some organizations in our sample had decided to do something about this prior to our study. These organizations formed work teams of their assembly line workers. These teams worked as small groups. They were paced by the rate at which the team worked rather than by the rate at which the assembly line was mechanically driven. This socio-technical change was similar to innovations introduced by Saab and Volvo in Sweden.

Our data suggest that even in high stress work such as on an assembly line, such changes might be sufficient to produce reductions in both stress and strain. The teams on nonpaced lines, compared to workers on machine paced lines, had significantly higher scores on the following desirable aspects of work: Job Complexity and goodness of person-environment fit on complexity in their jobs, better person-environment fit with regard to work load, higher utilization of their skills and abilities, more opportunity to concentrate on their jobs and to exercise responsibility for others, and higher levels of participation. They also showed significantly less boredom, anxiety, depression, and somatic complaints. Further analyses revealed that the occupational differences in boredom were entirely accounted for by occupational differences in utilization of skills

and abilities and by goodness of fit with regard to job complexity and work load.² Goodness of fit on these measures also accounted significantly for part of the variance between the two groups with regard to depression, somatic complaints, and anxiety. These findings suggest that even in the high stress work of assembly operations, there is the possibility of reducing strain by changing the methods of work.

The Need for Field Experiments

Obviously there is a limit to what one can conclude from any set of data. These findings, however, appear to provide a basis for moving to field experiments aimed at the primary prevention of poor mental and physical health. First, they provide a set of measures potentially useful for evaluating the effects of such field experiments.

Second, our findings suggest that the introduction of employee participation may be one of the most effective mechanisms for giving people the opportunity to fit themselves to the job and to help develop a set of role demands from the people with whom they work which fully use their skills and abilities. There already exist several experimental studies on participation which demonstrate its effectiveness in improving employee satisfaction and job performance (e.g. Coch & French, 1948; French, Israel, & Aas, 1960; Morse & Reimer, 1956). We have also initiated trials attempting to use participation by teams of white collar workers as a mechanism for improving person-environment fit (Campbell, 1973). This concept of fit will now be discussed by our next speaker, Dr. Harrison.

²These analyses compared the amount of variance (ω^2) in these strains accounted for by occupation before and after residualization for the effects of the job stresses. Measures of stress which showed significant occupational differences for the two types of work, and which were significantly correlated with the strains, were used in regression equations of the effects of the stresses on the strains. These equations were used to obtain the residualized scores for the strains.

JOB STRESS AS PERSON-ENVIRONMENT MISFIT

R. Van Harrison

Dr. French has introduced our theoretical framework and methods used for the study. Dr. Caplan has summarized the general findings concerning stress-strain relationships and occupational differences in stress and strain. While their presentations have dealt with most of the measures in the study, mine will have a more narrow focus. I shall discuss in detail some aspects of the study concerned with person-environment fit. A brief review of the theory of person-environment fit will be presented first. Then data from the study designed to test the theory will be presented. Finally, some implications for reducing job stress will be suggested.

Person-Environment Fit Theory

Pervin (1968, p. 65) has noted that: "In one way or another the history of psychology reflects systems based upon an exaggerated emphasis on the individual or on the environment" (e.g., McDougall's 1908 text and the one by Ross in the same year, psychoanalysis and stimulus-response theory, introspection and behaviorism, need theory and role theory, the nature versus nurture controversy). These emphases can also be found in the job stress literature. Some researchers have chosen to focus on the effects of environmental characteristics such as technology or standard performance levels. Other researchers have emphasized effects of personal characteristics such as social status or personality type.

Our view of stress follows from the historical traditions of the field theory proposed by Kurt Lewin (1951) and the need-press theory proposed by Henry Murray (1938). Human behavior is not understood in terms of either the environment or the person alone, but in terms of the interrelationship of the two. (I will take the liberty of noting that while many researchers agree with this statement in principle, the methodological difficulties of simultaneously studying the person and the environment often result in the actual practice of studying only one of the components.)

The theory of person-environment fit which I am discussing today was formulated by French, Rodgers, and Cobb (1974). They emphasize two kinds of fit between the individual and the job environment. One kind of fit is the extent to which the person's skills and abilities match the demands and requirements of the job. Another kind of fit is the extent to which the needs of the person

are supplied in the job environment. The basic assumption of the theory is that when misfit of either kind threatens an individual's well being, strains will occur such as job dissatisfaction, anxiety, depression, and physiological problems.

Appropriate testing of the theory requires that the goodness of fit between the environment and the person be measured quantitatively. In the present study this has been done by asking an individual to rate the extent to which a work characteristic is present in the job environment, for example, "How much work load do you have?" The individual is also asked to indicate his preference for the work characteristic on the same scale, for example, "How much work load would you like to have?" By subtracting the amount preferred by the person from the amount in the job environment, a quantitative score of person-environment fit is produced. The fit between the job and the individual can be measured on many dimensions including the complexity of the job, the responsibility for other persons, the amount of participation in decision making, and the social support in the job environment.

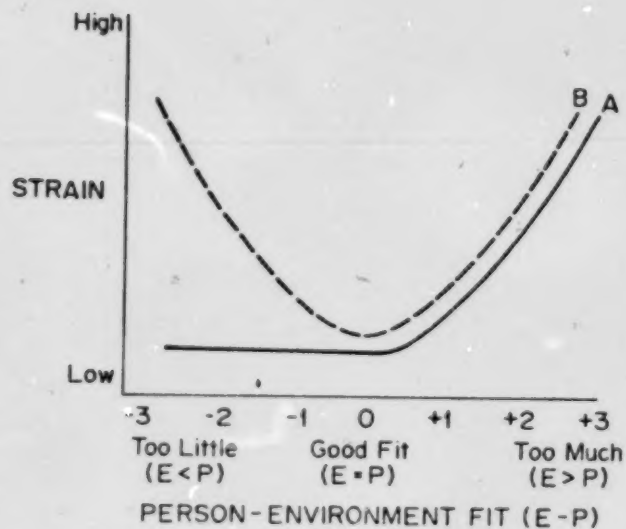


Figure 1. Two hypothetical relationships between P-E fit and Strain.

In Figure 1 the horizontal axis presents a scale of person-environment fit. Negative numbers represent a deficiency--the person wants more of the characteristic than the environment provides. Zero represents perfect fit. The positive numbers represent an excess. Two hypotheses relating goodness of fit to strain are also represented in Figure 1. One hypothesis suggests that increasing environmental demands beyond the person's abilities will produce increasing strain, as shown in Curve A. According to this hypothesis, demands within the individual's abilities will not produce strain. For example, work load demands beyond the individual's abilities should produce increasing strain. However, so long as the work load remains within the individual's abilities to handle it, strain should show the same low level as perfect fit.

Curve B represents a more complicated hypothesis which assumes that a deficiency will also produce strain. This V-shaped relationship should occur when an excess threatens one need and a deficit threatens another. Fit on job complexity presents an example of a variable likely to have this V-shaped relationship with strain. If the job is not complex enough, the individual may become bored and dissatisfied with the job. If the job is too complex, the individual may be threatened by failure and suffer from increased anxiety or depression.

The hypotheses represented by Curves A and B seem reasonable, depending on the type of dimension on which the goodness of fit is measured. Person-environment fit theory suggests that fit measures offer a means to increase our ability to identify job stress and predict job-related strains. The curvilinear relationship between person-environment fit and strain should account for variance in strains over and above that accounted for by the linear effects of characteristics of the environment and of the person. This prediction was tested in the Job Demands and Worker Health Study (Caplan, Cobb, French, Harrison, & Pinneau, 1975).

Results

Today I am going to focus on the two person-environment fit dimensions of job complexity and work load. (See Harrison, 1976, for analyses including other dimensions of person-environment fit.) Job complexity refers to the qualitative demands and opportunities on the job such as the absence of a work routine, the handling of several tasks at once, and dealing with a variety of people. In contrast, work load refers to the quantitative demands and opportunities on the job such as the number of tasks to be handled and the time in which they must be accomplished.

You will recall that a representative subgroup of the entire study sample was formed by randomly selecting approximately 14 men from each of the 23 occupations to produce a random stratified sample of 318 men. The relationship between job complexity and depression in this subsample is presented in Figures 2 and 3. In Figure 2 the solid line illustrates the relationship between depression and the level of complexity in the job environment. The dashed line illustrates the relationship between depression and the level of job complexity preferred by the person. Though there is a tendency for depression scores to decrease both for individuals in more complex job environments and for individuals who prefer higher job complexity, neither relationship reaches statistical significance.

How well do these scores predict depression when they are combined into a person-environment fit score? Figure 3 presents the relationship between depression and person-environment fit on job complexity. Depression is lowest for those with perfect fit and increases with either too little job complexity or too much job complexity. This relationship closely approximates the hypothetical V-shaped relationship represented by Curve B in Figure 1. The person-environment fit scores clearly predict depression better than either of the component environment or person scores.

The advantage in using the person-environment fit score can be easily quantified when a simple transformation is made. Whenever a curvilinear relationship between strain and person-environment fit is basically V-shaped, it can be transformed to a linear relationship by taking the absolute value of the person-environment fit score. For example, fit scores of minus 1 and of plus 1 would both be given a general misfit score of 1. Whenever the relationship between fit and strain is made linear, standard statistical techniques such as correlation and multiple regression can be used to compare how well strain is predicted by measures of the environment, the person, and fit.

Table 1 presents the relevant data for job complexity and several strains. The first three columns present the correlations between the amount of job complexity in the environment, or the amount preferred, or the amount of person-environment misfit and the strains in the left margin. For every one of the six strains, the correlation with misfit on job complexity (see column 3) is as high or higher than the correlation between the strain and either the environmental level or preferred level scores.

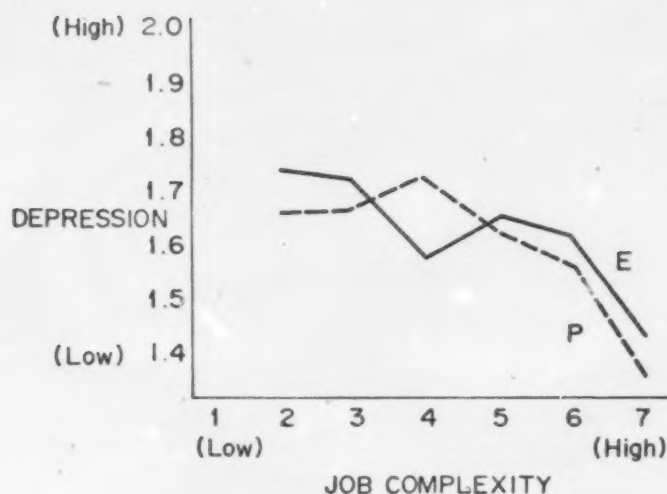


Figure 2. Relationships between scores on Depression and scores on Job Complexity-E and Job Complexity-P. $\eta^2 = 0.14$ (NS) and 0.19 (NS) respectively. Random stratified sample, $N = 318$.

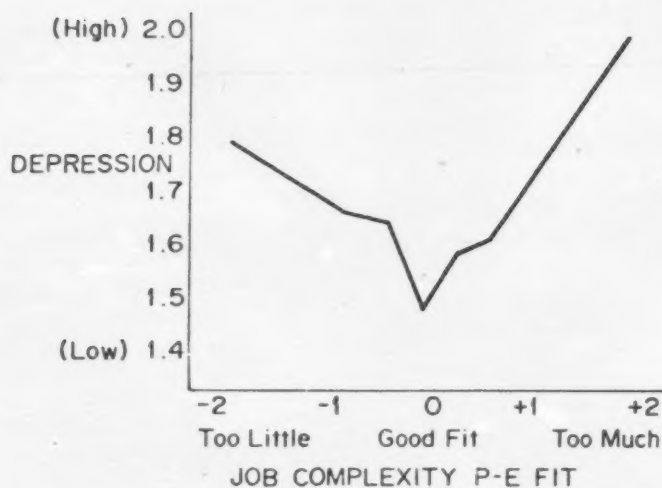


Figure 3. Relationship between Job Complexity P-E Fit and Depression. $\eta^2 = 0.26$ ($p < 0.002$). Random stratified sample, $N = 318$.

Table 1

Correlations and Multiple Correlations between Strains and the E, P, and Misfit Indices of Job Complexity

Strains	Correlations			Multiple Correlations	
	Environment (E)	Person (P)	Misfit (IE-PI)	E and P	E and P with addtl effects of Misfit
Job Dissat	-.31	-.30	.47	.34	.50*
Boredom	-.51	-.34	.51	.51	.61*
Somat Cmplnts	NS	NS	.16	NS	.18*
Anxiety	NS	NS	.21	NS	.25*
Depression	NS	-.12	.22	NS	.23*
Irritation	NS	NS	.15	NS	.20*

Note: Random stratified sample, N = 318. For all correlations presented, $p < 0.05$.

* The addition of Misfit increases the multiple correlation significantly, $p < 0.05$.

Table 2

Correlations and Multiple Correlations between Strains and the E, P, and Misfit Indices of Work Load

Strains	Correlations			Multiple Correlations	
	Environment (E)	Person (P)	Misfit (IE-PI)	E and P	E and P with addtl effects of Misfit
Job Dissat	NS	-.26	.22	.27	.30*
Boredom	-.19	-.28	NS	.31	.33
Somat Cmplnts	NS	NS	NS	NS	NS
Anxiety	NS	NS	NS	NS	NS
Depression	NS	-.29	.24	.30	.34*
Irritation	.21	-.15	.17	.27	.28

Note: Random stratified sample, N = 318. For all correlations presented, $p < 0.05$.

* The addition of Misfit increases the multiple correlation significantly, $p < 0.05$.

The fourth column presents the multiple correlation of both the environmental level and preferred level of job complexity with the strains. These values represent the combined ability of the environmental measure and the person measure to predict the strains. Note that these additive effects are generally weaker than the effects of our measure of misfit. The last column presents similar multiple correlations, except the predictive ability of the misfit measure has also been included. The difference between these last two columns represents the variance accounted for by the misfit measure beyond that accounted for by the environment and person measures. The measure of misfit on job complexity accounts for significant additional variance in each of the six strains.

Table 2 presents similar relationships between work load and the strains. As the first three columns indicate, either the measure of the environment or of the person performs as well or better than the misfit measure in predicting each of the six strains. Comparing the fourth and fifth columns, misfit on work load accounts for significant additional variance only for two strains, job dissatisfaction and depression.

When one compares fit on job complexity and fit on work load in Tables 1 and 2, there is a striking difference in the predictive ability of the two misfit measures. The poorer performance of misfit on work load appears to be due to occupational differences in how people view the meaning of misfit on work load. Figures 4 and 5 present data supporting this.

Figure 4 presents the relationship between fit on job complexity and job dissatisfaction for each of four occupations. For each occupation the relationship approximates the V-shape of hypothetical Curve B fairly well. The same shape was also characteristic of the relationship with the twelve other occupations where the relationship was examined. Misfit on job complexity, whether it be deficiency or excess, is associated with increased job dissatisfaction in all of the occupations in the study.

Figure 5 presents the relationship between fit on work load and job dissatisfaction for the same four occupations. Work overload, the right half of the figure, is related to increased job dissatisfaction in all of the occupations. However, as shown in the left half of the figure, the relationship between work underload and job dissatisfaction changes from one occupation to another. Work underload seems to have little effect on the job dissatisfaction of assembly line

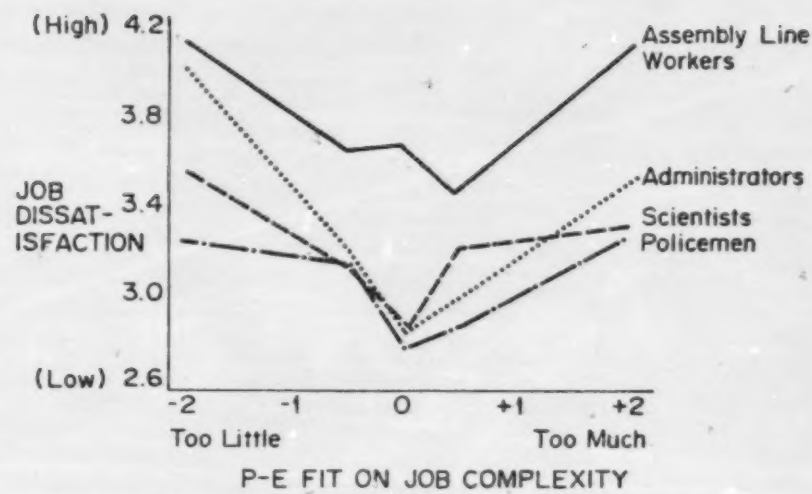


Figure 4. Relationships between Job Dissatisfaction and P-E Fit on Job Complexity within representative occupations. For all relationships $p < 0.05$. $N \approx 100$ within each occupation.

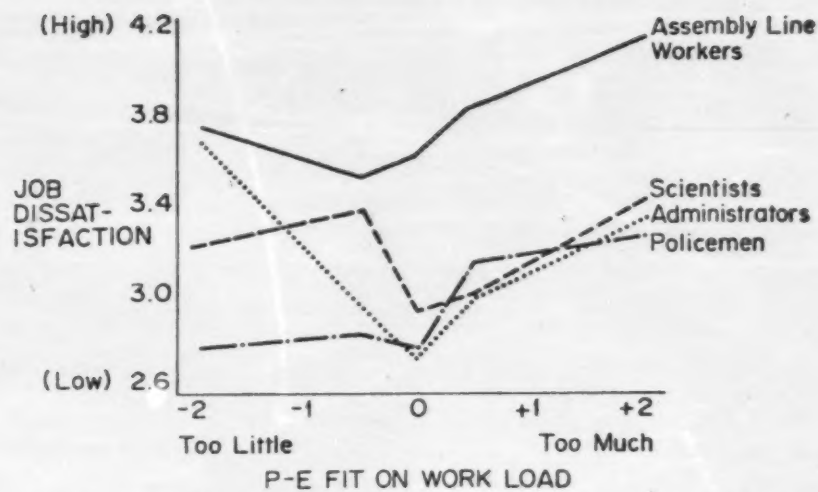


Figure 5. Relationships between Job Dissatisfaction and P-E Fit on Work Load within representative occupations. For all relationships $p < 0.05$. $N \approx 100$ within each occupation.

workers and policemen. The relationship for these occupations approximates hypothetical Curve A in Figure 1. Work underload increases job dissatisfaction for administrators and this relationship approximates hypothetical Curve B. Work underload tends to increase job dissatisfaction for scientists, though the relationship only roughly approximates Curve B.

Why should the relationship between work load and job satisfaction vary across these occupations? Analysis of the data has shown that the curves do not change in relation to the mean level of work load in the job environments. An explanation is suggested, however, by findings concerning intrinsic gratification in various occupations (House, 1972). On the average, professionals such as scientists and administrators have been found to want a high level of intrinsic satisfaction in their jobs. Work underload can reduce the availability of intrinsic satisfaction and thus increase overall job dissatisfaction. Assembly line workers were, on the average, found to be less concerned about intrinsic satisfaction in their jobs. Work underload would therefore not be expected to increase their job dissatisfaction. This explanation may possibly apply to policemen as well.

Person-environment fit theory clearly predicts that it is misfit which causes strain. This particular study can provide only limited evidence concerning this causal sequence since the data are cross-sectional. You will recall from Dr. Caplan's presentation that we have proposed a model where misfit has the strongest direct impact on job related affects such as boredom, work load dissatisfaction, and overall job dissatisfaction. If misfit causes strain, measures of fit should have stronger independent relationships with these strains than measures of either characteristics of the person or of the job environment. This study has a total of 34 measures which deal with either the person, the job environment, or their fit. All 34 measures were included as predictors in a series of multiple regressions in the random stratified sample to determine which of the measures has significant independent relationships with the various strains. In order to be sure that the results were reliable, the procedure was repeated on a separate subsample where all of the occupations were represented equally.

The results of this analysis were that overall job dissatisfaction and boredom each had two consistent independent predictors--and they were fit measures. Work load dissatisfaction had three consistent independent predictors, two of which were fit measures. These findings support the assumption that the primary

link between job stress and health strain is person-environment misfit. Longitudinal studies examining relationships between fit and strain are reported by Campbell (1973) and by Vickers (forthcoming). They both present evidence from across time analyses which suggest the direction of causation is indeed from fit to strain as predicted by the theory:

Summary. Let me summarize the evidence for person-environment fit theory which I have presented so far. First, the goodness of fit between the individual and the job environment can account for variance in strains which is not predicted by the component person or environment measures, either separately or in additive combination. Second, the curvilinear relationships predicted by fit theory have been observed between various strains and misfit on both dimensions within several occupations. Finally, in accordance with the overall model of person-environment fit, it is misfit which is the strongest correlate of strain. The support for the theory clearly suggests that additional research should explore the fit between the worker and the job rather than either component alone. Important dimensions of fit should be identified. The levels of misfit which produce health strain must be determined. While such future research may offer many suggestions for reducing stress, the evidence I have presented today has some general implications for present attempts at programs to reduce job stress. I would like to spend the last couple of minutes of my presentation discussing these implications.

Implications for Reducing Job Stress

The data I have presented indicate that job stress will not be reduced by general programs which treat all individuals identically. Worker preferences will vary as do job environments. This conclusion is supported by the distribution of fit scores in the present study. Within almost every occupation at least 20% of the respondents reported too little job complexity while another 20% or more reported too much job complexity. The fit scores on workload have a similar distribution. These wide distributions within occupations emphasize the diversity of individual preferences which can be found within any one occupational setting.

How then should job stress be reduced? The inescapable conclusion of person-environment fit theory is that in order to reduce job stress for all persons, programs must allow individualized treatment of a worker. Although such individualization may be impossible in some situations, I would like to present two general ways it may be attempted.

One approach for reducing job stress would be to use measures of person-environment fit to identify those individuals experiencing high levels of misfit. These individuals can then be the focus of special attempts to reduce stress through procedures such as counseling, training, and job transfer. You will note that this approach places the responsibility for intervention to reduce stress on people other than the worker who is experiencing poor fit.

Another approach suggested by fit theory would place much of the responsibility for reducing stress on the individual worker. By increasing the control workers have over their jobs, they can modify the demands of their jobs themselves to bring about a better fit with their individual preferences. This approach should not be confused with job enlargement or job enrichment. Proponents of job enlargement assume that all individuals want challenging and involving experiences at work. The evidence supporting person-environment fit theory suggests that enlarging an entire set of jobs may improve fit for some, but it will also worsen fit for others who prefer simpler job routines.

Advocates of job enlargement programs often propose giving people more participation in decisions affecting their jobs. They assume, however, that providing the worker with more control will meet the needs for challenge and involvement felt by all individuals. While person-environment fit theory also suggests that increasing worker participation is important, the theory suggests it is important because a more complex process can then occur. The increased control allows the worker to structure the job to better fit his preferences--whatever these preferences may be. Those who want more complex and challenging jobs can take advantage of the opportunities opened up to them. Those individuals who prefer simpler jobs can choose to delegate decision making to others who want this job demand. Remaining tasks can be routinized in ways which minimize their demands on the worker.

The tremendous advantage of allowing some individualization of the job is that it creates a mechanism for the ongoing maintenance of good fit. As either personal preferences or job demands change, the individual can--without outside intervention--make adjustments in the job to lessen stress and improve fit. The findings of a field study by Campbell (1973) support this reasoning. Good fit on participation at one point in time lead to continued good fit on several other job dimensions at a later point in time.

In concluding, I must point out that it will not be easy to develop organizational control structures and technologies which allow some individualization

of the job. This approach to reducing job stress conflicts with traditional management practice. Bureaucratic approaches require that all individuals be dealt with identically. New approaches for coordination between individualized jobs must be developed. Additionally, ethical questions will arise about equitable pay for different levels of job performance in individualized jobs. Given such conflicts, it is probable that job stress cannot be totally eliminated. We can, however, strike compromises to minimize it--compromises which will better the fit between the worker's preferences and the demands of the job.

EFFECTS OF SOCIAL SUPPORT ON OCCUPATIONAL STRESSES AND STRAINS

S. R. Pinneau, Jr.
Bowman Gray School of Medicine

The stress and strain of life are popular themes for both the lay population and behavioral scientists. People seem to enjoy a chance to complain about what the stress of their lives does to them: their demanding supervisor is giving them an ulcer; their children are driving them crazy, and so forth. Likewise, scientists and clinicians have done extensive research on human adaptation to stressful environments and on the strains which result. Yet for all the attention given to the stresses of our social environment, until recently there has been relatively little research on the positive side of our social existence. The present paper will look at these brighter perspectives and focus on the benefits we reap from supportive social relationships.

Recent reviews have assembled some suggestive findings about the relation of social support to mental and physical health (Cobb, in press; Gore, 1973; Pinneau, 1975; Pinneau, et al., forthcoming). Studies cited in these reviews have considered support within the work organization, the family, friendship networks, and the community generally. In the present study we hoped to use our large sample of working men to explore the nature of these effects, and to determine their magnitude and consistency across several occupations, for several measures of support, and for several dependent measures.

Measures¹

In considering how to measure social support we recognized that many dimensions of interpersonal needs could be identified. Given time and space limitations, it was decided to measure broadly two classes of support. The first class is tangible support, i.e., concrete assistance such as helping a person complete a task or sharing resources. One of the tangible items asked, "How much does each of the following people go out of their way to do things to make your work life easier?" The second class of support measured is psychological-emotional support, as in lending a sympathetic ear, reassuring, or demonstrating concern and love. For example, one item asked, "How easy is it to talk with each of the following people?" For items in both of these areas we asked the men to indicate

¹Other methodological details were described in the introductory paper by J. R. P. French, Jr. (See also Caplan, et al., 1975; Pinneau, 1975; Pinneau, et al., forthcoming).

how supportive were three different groups of people: their supervisors at work, other people at work, and their wives, friends, and relatives. In this way it was hoped that we would have six measures of support. Analysis of the data revealed, however, that items in the intended clusters of tangible and emotional support correlated as highly with items in the other cluster as they did with items in their own. That pattern of correlations made it impossible to construct two independent measures. We therefore present the following findings for three general measures of support, one for each source of support: the supervisor, the coworkers, and the home.

Hypotheses

Based on previous findings and on theoretical work, we expected that social support would have three major types of effects. First, we predicted that support would reduce job stresses. That is, the men with supportive others around them would experience less overload, less role ambiguity, a better fit with the characteristics of their jobs, and so forth. This prediction is easy to make, since the tangible support items asked explicitly about the provision of help on the job. Since most families are not in a position to provide help while a man is on his job, we expected that the stress reducing effects would be achieved primarily by supervisor and coworker support, rather than by home support.

Our second hypothesis was that social support would also reduce measures of psychological and physiological strain (for example, job dissatisfaction, anxiety, blood pressure). The prediction of support effects on job dissatisfaction was made because interpersonal relations are generally a salient part of one's job, and thus of one's attitude toward it. We expected that our measures of supervisor and coworker support would reflect generally the nature of those relationships. Support effects were predicted for the affective and physiological measures because the cognitions which seem central to their responses are readily influenced by other people: for example, self-doubt and hopelessness in depression, expectation of punishment or criticism in anxiety, and numerous types of threat for autonomic responses (see Pinneau, 1975).

Third we predicted that support would have a tempering or buffering effect on the job stresses, so that the well supported man would not show as much strain in response to job stress as would their less supported peers. This hypothesis was based on the expectation that high social support would sometimes nullify the threatening implications of the job stresses, thus reducing their impact on strain. For example, high work load should not produce as much anxiety

or dissatisfaction if one has an understanding, supportive supervisor. Our expectations for such buffering were bolstered by previous findings in our research program (Caplan, 1971; Core, 1973) and by numerous other studies with suggestive results (see Cobb's review, in press).

Results

Each of the three hypotheses was tested in the stratified random sample, and in each of the 16 more homogeneous occupational subgroups. Tests for the physiological strains were made in the heterogeneous physiological sample and in the one large occupational group with physiological data, the air traffic controllers. Considering the numerous measures of stress, strain, and support, and the 18 samples of men, there were thousands of correlation coefficients to examine for evidence to support our hypotheses. However, the detailed analyses are available elsewhere (Pinneau, 1975; Pinneau, et al., forthcoming), and time here will be devoted to describing only the general shape of the findings. It should be noted that null hypotheses were not rejected when single statistics reached significance, but only when the overall pattern of numerous coefficients demonstrated a reliable finding.

Looking first at the effects of social support on stresses, the data agreed well with our predictions. Support from home had little effect on job stresses, while support from supervisor and from coworkers both had numerous effects on a variety of stress measures. The size of the correlations varied considerably from occupation to occupation, but the direction of significant effects was almost always as predicted. Men with high support from either supervisor or coworkers generally reported low role conflict, low role ambiguity, and low future ambiguity, high participation, and good utilization of their skills. To some extent they also reported good fit with their work load and with the complexity of their job, and equitable pay. The magnitudes of these correlations were often in the .30's and sometimes in the .40's (significant beyond the 1% level since the samples ranged from $N = 74$ to $N = 318$). Thus the hypothesized reduction of stresses by support was well confirmed by the data.

I recognize that these cross-sectional data are equivocal regarding what causal processes led to the associations. It can be argued, for example, that low role conflict and high participation are conceptually overlapping with social support, or that the causal impact of other organizational variables may have introduced the covariation of stresses and support, or even that stresses may

reduce social support. Decisive evidence to rule out such alternative explanations requires research strategies which go beyond cross-sectional data. We can presently note only that the data seem to fit well with the predicted capabilities of social support.

Our second hypothesis predicted that social support would reduce psychological and physiological strains in the employees. In order to test this hypothesis it was necessary to disentangle the support effects from the effects of correlated stresses. Step-wise multiple regressions were therefore performed for each of our psychological strain measures within each of the 16 occupational groups and within the stratified random sample. The results of these regressions showed that social support predicted significantly to low levels of psychological strain in a large number of instances. Partial correlations of support with a strain, other significant predictors held constant, ranged from the teens to the .40's, with significance often well beyond the 1% level. Again, there were major occupational differences in which variables were significantly reduced by which support measures. Yet the direction of the effects was overwhelmingly in the predicted direction (33 out of 34 significant effects being as predicted). The pattern of effects also agreed with our predictions in that home support correlated much less often with the job dissatisfaction measures than did supervisor and coworker support. Each of the general affective strains (i.e., depression, anxiety, and irritation) was, however, affected by both home and work support measures.

Depression was the measure most frequently correlated with support; fifteen significant support effects were found in the sixteen occupations. Again, the cross-sectional nature of these data force a cautious interpretation. The apparent effect of support on depression could stem partly from the tendency of depressed individuals to have a distorted perception of the support they receive.

If our data had shown support to affect physiological strains, some of the doubts about causality might have been eased. Unfortunately, no physiological measure was significantly reduced by any support measure.

Now that we have seen strong effects relating social support to at least some stresses and strains, we may consider the hypothesized buffering effects of support. Although support had numerous main effects on psychological strains, we found little evidence in the present data that it could prevent stresses from affecting these strains. The number of interactions between support and stress

measures did not exceed what we would have expected by chance under the null hypothesis, and the interactions were not primarily in the direction predicted.

Examination of the physiological strains also showed little evidence of buffering. However, for these strains the possibility that support could buffer against the stress effects was a rather moot issue, since we found little evidence that stresses affected the physiological strains either.

Discussion

It seems to me that the data I have described in this paper provide some evidence that social support reduces psychological stresses and strains, but little evidence that it reduces physiological strains or that it buffers an employee against the stresses of his job. In the remainder of my time I would like to raise questions about the mixed set of these results, about their practical applicability, and about the general state of our knowledge of social support.

First, I would ask why we failed to find that social support had a protective or "buffering" effect, as had been reported in other studies. The possibility of a buffering process seems most important to resolve because of its practical significance. If social support can reduce the ability of stresses to produce strain, then we may hope to reduce the high strains of some occupations even though the stresses in those occupations are themselves difficult to alter.

My pursuit of a stronger conclusion about the hypothesized buffering process led me to re-examine critically previous studies in which it had been reported (e.g., Caplan, 1971; those cited by Cobb, in press). I found that very few studies were clear examples of buffering by social support. Many studies which had been mentioned as support for the hypothesis had serious defects: measures of support were highly confounded with other major variables; results were not statistically significant; significant effects had been discovered only by examining a very large number of relationships; a main support effect on the dependent variable was found, but there was no clear demonstration of a significant interaction between support and stress in predicting strain; or there was only poor evidence of validity for the stress which was supposedly buffered. After this re-examination of the literature, I have to wonder whether this attractive-sounding hypothesis has ever had many strong quantitative data behind it. I suspect that really persuasive evidence will be attainable only after we establish what precisely constitutes the dimensions of social support and how we should assess them--a point to which I will return momentarily.

My second question would ask why we failed to obtain any effects on the physiological strains. There are not too many studies in the literature which

report social support to affect physical health or related physiological variables. Experimental studies seem to have had more consistent success with physiological responses than have surveys. Perhaps the present study and other survey research suffer from the considerable noise in physiological values which is introduced by a variety of much more powerful influences: diet, physical activity, etc. This interpretation is consistent with the general insensitivity in the present study of physiological measures to all the psychosocial variables we included.

Third, I would ask how much confidence we may have in the ability of social support to reduce psychological strains. Remembering that our findings are only correlational, do we really have enough evidence to argue that one should intervene in an organization and attempt to reduce strain by building social support? As Caplan suggested earlier, we need field experimentation to evaluate the potential of such interventions.

Finally, I present a basic question: how much do we understand about providing support? What qualities of a relationship best reduce strain? Or is it even feasible to seek to answer such questions generally, without considering the particular needs of each individual? Certainly, social support is a question of person-environment fit. But I am unsure that even relationships which attempt to meet the individual's unmet needs are necessarily the ultimate in social support. Consider, for example, the person who needs acceptance and approval. Praise and positive evaluation may meet those needs. Yet as Carl Rogers has pointed out, to receive the positive evaluation one seeks may keep one dependent on such feedback, maintaining that social need. Our understanding of social support thus requires more than a taxonomy of social needs. Other qualities of the dynamic relationship may be crucial. For example, Rogers (1961) proposes that unconditional positive regard helps a person grow beyond the need for social approval. I think we need to understand the possible effects of such other types of supportive processes.

One of the clearest reflections of our ignorance about social support is present in the current results: we are not able to explain the major occupational differences in the significance of support for psychological strains. We still need to understand why, for example, supervisor support is influential for job satisfaction in some groups, but coworker support is important in others, and neither has an effect in still other groups. One possible explanation would involve the differential importance of different types of support. Perhaps the

type of support which makes a difference for some situations or for some groups of people is not represented in our items.

It seems to me that for all the questions I have raised above, future research would benefit most greatly from a comprehensive conceptual analysis of social support. Only once we have achieved such an analysis will we be able to construct the most relevant set of measures of social support for any given set of conditions. In turn, such a set of measures is essential if we are to develop and test theories which predict group differences in support effects. Then, finally, after we have gone through all the work necessary to understand those differences, we could propose intervention strategies with a good chance of succeeding in diverse organizational settings.

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